THE USE OF A COMPUTER GENERATED VIRTUAL REALITY DRIVER TRAINING SIMULATOR FOR AIRPORT PERSONNEL

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It is costly and dangerous to take inexperienced vehicle operators out on to any Airport Operation Area (AOA) to receive vehicle operational training. Unlike a city environment where lesser used roads and parking lots can be used to provide basic skill level training to students, prior to going into heavy traffic, on an airport the skill that you are trying to hone or develop is the students safe conduct and association to runways, taxiways, signs marking and the need to communicate with Air Traffic Control. In addition to basis airport driver familiarization training, specialized operational skills must be taught to those individuals who are tasked to drive emergency response vehicles and other vehicles such as snowplows and maintenance dump trucks on airfields to insure their safe operation.

A complex problem has existed at our nations airports for many years. This problem has escalated with the increasing number of heavy fire rescue vehicles, which have been rollover in the last twelve years. At least 44 known rollovers have occurred. Most of these vehicles were made by manufacturers within the United States and met the requirements of Federal Aviation Administration (FAA) Advisory Circular 150 5210- 10A or 10B for major rescue vehicles. The three recent rollover accidents happened in FY 2001. The last rollover occurred in the winter of 2002. These accidents occurred even at a time when government regulatory requirements are being updated to provide higher dynamic performance for all major ARRF rescue vehicles. Working with industry representatives as well as major truck manufacturers, the FAA Airports Office have been working extensively to redesign vehicles and provide more dynamic stability to heavy rescue vehicles while performing high-speed turns.

The United States Department of Transportation (DOT), Federal Aviation Administration provides funds through the Airport Improvement Program (AIP) to airports for the purchase of heavy rescue vehicles. This program provides a financial offset to the airport certificate holder in the form monetary grants of as much as 90% to purchase airport rescue vehicles. The FAA has performed research on dynamic stability of these vehicles with its High Performance Research Rescue Vehicle (HPRRV). The FAA has upgraded performance testing requirements by adding a tilt table or slid slop performance test. New testing requirements of heavy rescue vehicles (HRV) also include a turning radius standard and the ability to demonstrate 90 degree turns at a simulated rescue response speed. HRVs must also successfully perform runway and taxiway intersection turn navigation. All of these new test procedures are contain in the 150-5210-10C Advisory Circular, which was published in March of 2002.

There are numerous things to consider related to the rollover issue:

1. There is no national truck-driving test or standard certification (such as required by professional over-the-road truck driver) required for airport rescue vehicle operators.

Any individual driving a 26,000 pound gross weight truck on public roadways must have a Department of Transportation "Class B" drivers license. This requirement, for some reason, apply does not to airport emergency vehicle operators even though they often drive ARFF vehicles on public roadways in and about the vicinity of airport properties. Some of these roads in-

clude perimeter roads, terminal roads, and access roads where the traveling public or commercial vehicles may be operating simultaneously with ARFF vehicle traffic.

2. Heavy rescue trucks are high center of gravity vehicles. Driving these vehicles require specialized care and attention specifically under dynamic high-speed conditions of braking and turning.

Drivers are not given specific training opportunities to drive, handle and perform simulated high speed dynamic driving situations for fear that the vehicle might be damaged which would negatively impact the airports index category response capability.

3. FAR Part 139 contains no requirement that assures all airports emergency rescue drivers receive the level of training necessary to perform a mission critical response.

The FAA's annual response test is given to only selected individuals at airports.

4. The FAA's annual certification response test does not require every person whose job would require them to perform in an ARFF response to actually be a part of the certification process.

Instead, a demonstration is performed by a representative response group selected by the Fire Chief. Advance notice of the test is supplied by the certification inspector and tests are generally conducted under day light, good weather conditions.

5. The National Fire Protection Association (NFPA) develops national consensus standards related to various aspects of the airport emergency response. These standards include the NFPA 1002, Standard for Fire Apparatus Driver Operator Professional Qualifications 1998 Edition, which contains extensive driver training requirements.

The FAA does not require nor recommend that these standards, practices and guidelines be followed by airport fire services in FAR Part 139.

Given that airport authorities are reluctant to provide driver training with existing emergency response vehicles there appears to be a desire to provide a realistic substitute for the necessary training. ***Training Wheels*** is a mobile trainer simulator developed by Crash Rescue Equipment Services of Dallas, Texas. This mobile unit can be transported and set up for use at airports across the United States.

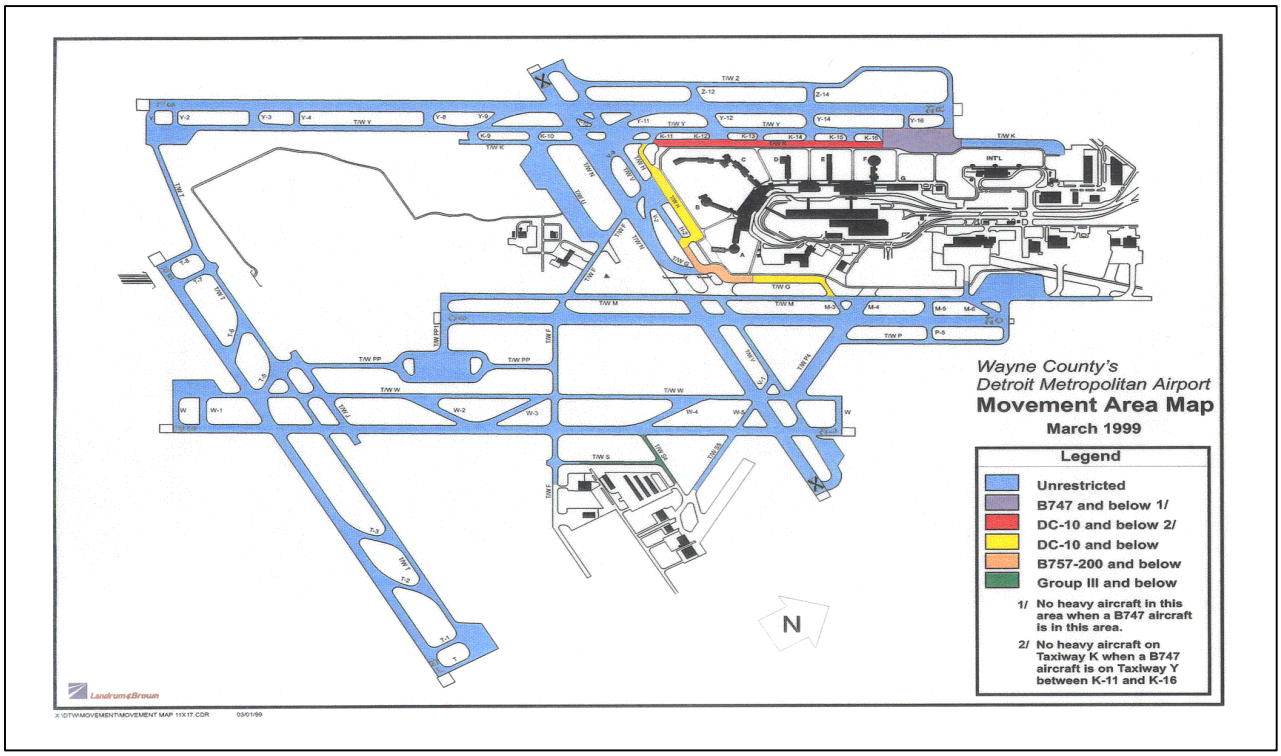
Why is it called "***Training Wheels***" and what can it do for the airport fire service?

- *It gives new employees driving experience prior to them getting behind the wheel of high cost airport vehicles.*
- *It provides airport personnel and contractors an opportunity to train in an airport environment without any risk to the airport operation.*
- *It provides very needed emergency response training under varying conditions and situations with both autonomous airport traffic and over the road traffic*
- *This training simulator is mounted in a 44-foot mobile trailer and can be brought to any airport's door in North America.*

- *It Brings Low Cost Training to Your Airport for*
  - *ARFF Operators*
  - *Airport Familiarization*
  - *Security Driver Training*
  - *Contractor-Operators*
  - *Snow Plow Operators*
  - *Field Maintenance Crews*
  - *Baggage Handlers*
  - *Airport Managers*

Driving Responses on Complex Airport

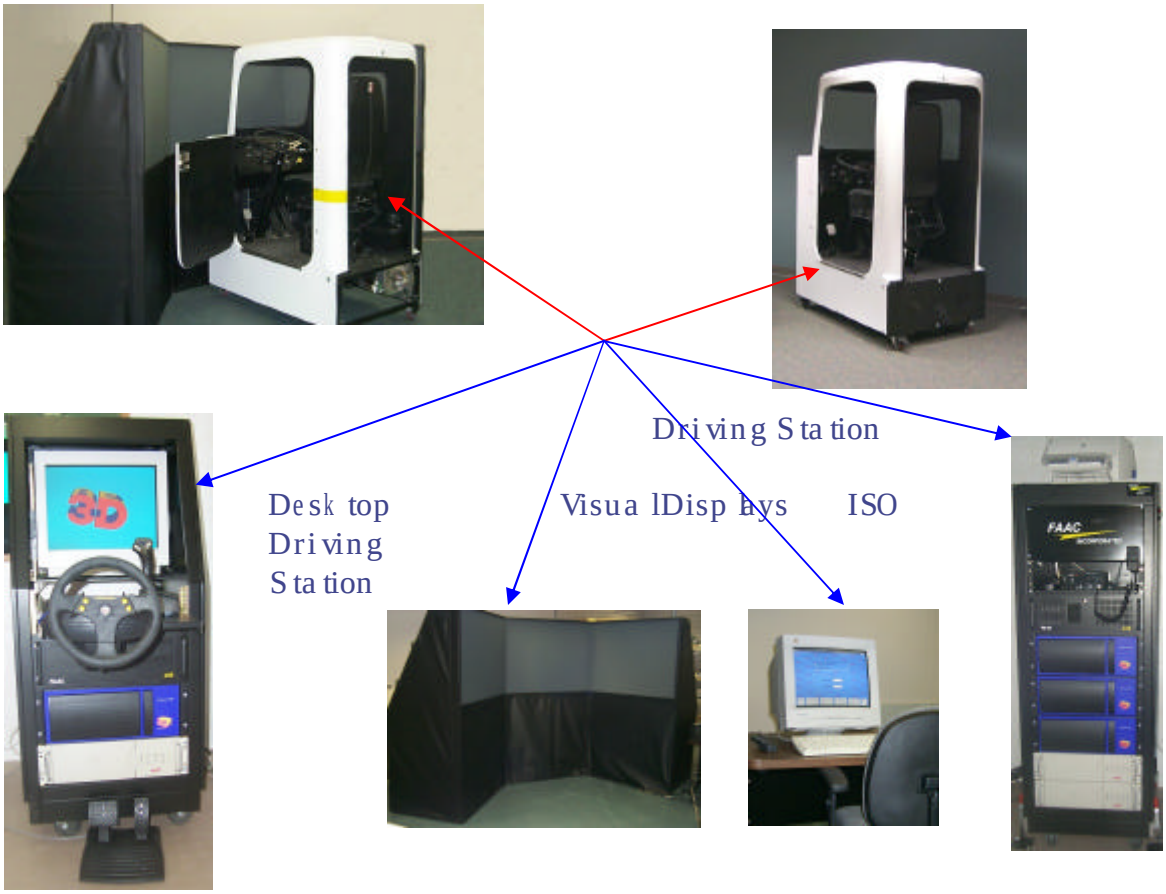
Drivers can be given the opportunity to drive on a complex airport design as well as very simple single runway designs. They can be provided various configurations under good or adverse weather conditions. The ability to drive under snow conditions is not only good training for ARFF vehicle drivers, but also good training for snowplow operators. Airport management personnel can practice airport inspections and routine driving skills.



Drivers' curriculums for emergency rescue vehicles operators are based on National Fire Protection Association Standards and Practices.

Physical Setup

Contained within a 44-foot mobile air-conditioned trailer with portable classrooms and two driving positions simulators, operators are presented with challenging driving situations. ***Training Wheels*** *is capable of providing numerous training scenarios, which provide drivers with challenging situations. These situations can be adjusted and changed based on the driver's skill level.*



Scenario Generations

- General Purpose
  - Non-scripted scenarios, uses autonomous traffic
  - Instructor varies traffic with sliders
  - Airport Familiarization
  - Snowplows- Dump trucks
  - SUV-Airport Management
  - Emergency Response Vehicles

- Airport Operations Area (AOA) Day, Night
  - Task-oriented scripts
  - Differ for each training environment

- ARFF Specialized
  - Multiple aircraft situations available
  - On landing gear with all evacuation slides deployed
  - Crashed with broken fuselage
  - Off-road environment with actual fire fighting required.

The computer interactive software allows environmental conditions to be changed per the students needs. Drivers are provided the opportunity to drive on the airfield, around the airport vicinity, on highway or in city driving conditions. In the airport environment the drivers can be offered the following situations.

- AOA Daytime or Night responses
  - Fog or other varied weather conditions
  - Time of Day
  - Starting Location
  - Scene Scenario Selection
  - Equipment Failures

- Snow Removal
  - Fog
  - Wind Speed/Direction
  - Site Scenario Selection
  - Starting Location
  - Failures

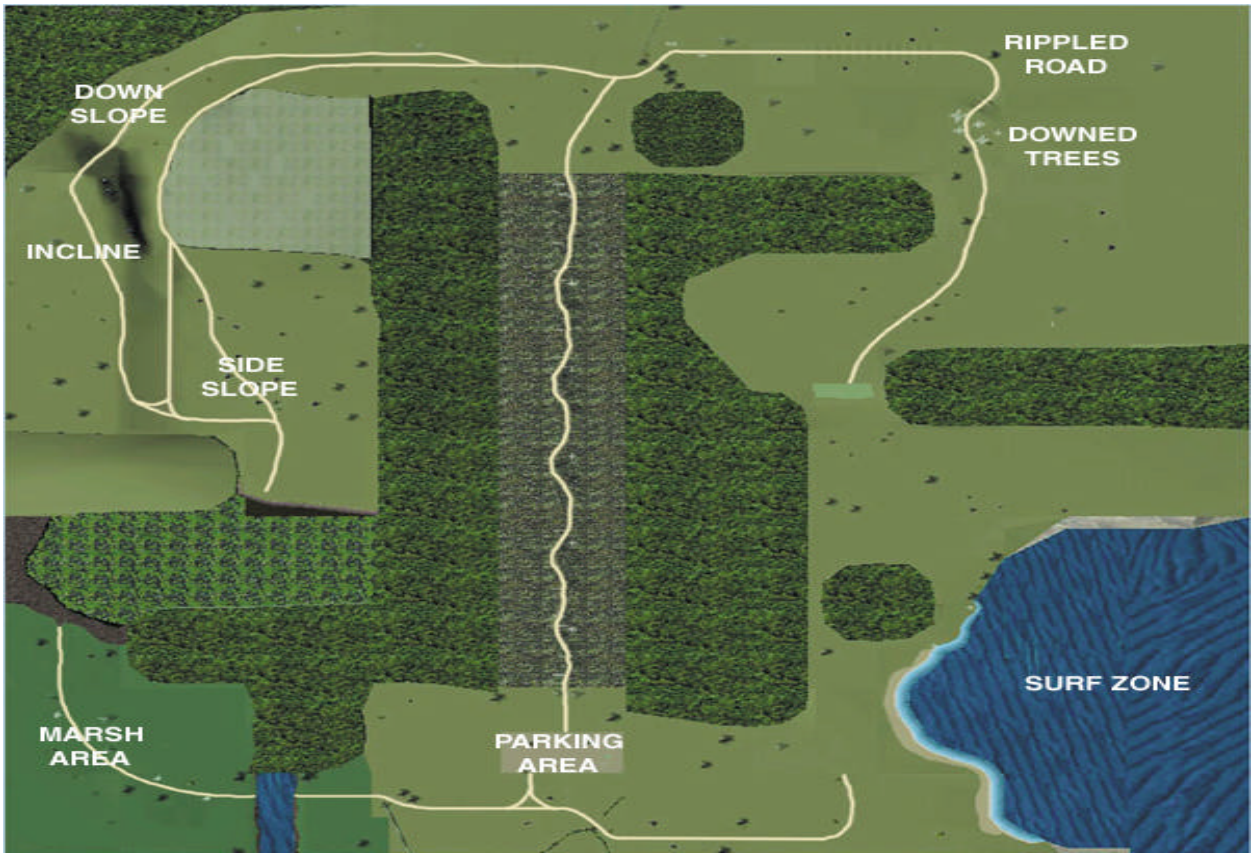
- AOA Airport Management Inspection
    - Task-oriented scripts
    - Various typical items to find during inspection

Airport rescue responders are rarely provided with opportunities to drive major ARFF vehicles under off road driving conditions. Without terrain recognition, drivers have a high probability of getting the vehicle stuck when making any off road response. Conditions can change rapidly under off road driving situations. Drivers need opportunities to hone these skills. Using actual first line vehicles for this training can put the airport at great risk. Should the drive mechanism fail due to overloading or other mechanical breakage, the rescue vehicle could be out of service for many weeks. This may require the airport to secure a temporary vehicle, which might not be of the quality, reliability or have the same operational characteristics as the broken vehicle.

The computer simulator offers the rescue response crews the opportunity to drive and practice off road responses. Firefighting tactics and strategies can be performed under varied terrain and weather situations.

OFF Road Driving Environment

Off road driving area includes hills with side slopes, rolling roadways, soft terrain areas and scenario generated emergency response problems including fire fighting..



Rollover accidents the cost is high: What is the impact of a single large rescue vehicle rollover accident to any airport? ***Of the 42 major vehicle rollovers in the last 12 years, 95% of these rollovers required major repairs that had an average cost of more than $200,000 each or required the complete replacement of the vehicle.*** In each of these cases the airport index response was put at risk and a majority of the accidents resulted in at least one fire fighter losing at least three days of work.

Drivers of all skill levels can benefit from the opportunity to practice their driving skills under varying situations and environmental conditions. The opportunity to practice off-road responses is one area in which few fire fighters ever experience until an actual off-road response is required. When was the last time your department experienced an off-road response on a rainy night with an opportunity to extinguish a simulated fire? How often do snowplow operators train? Are they receiving training under non-emergency snow conditions or “on the job”? New snow plow operators need to have the opportunity to drive under varying weather conditions

down to zero visibility conditions without the dangers associated with real aviation weather emergencies. The mobile simulated driver trainer can provide the experience in simulated potentially hazardous or dangerous driving conditions without jeopardizing the airport's fleet of vehicles.

Drivers of all airport vehicle types and various degrees of experience can use airport familiarization training. In FY 1999 there were 321 runway incursions nationwide. In FY 2000 there were 429 reported runway incursions – an increase of 33%. The National Transportation Safety Board (NTSB) identified runway incursions as the number one safety issue faced at airports today, and has highlighted this important operational safety issue in its annual safety report to the public and the FAA. Crash Rescue's Mobile Driver Simulator and Technology Demonstration Trailer can provide reinforcement training for those already authorized to drive on an airport. It can also be used as a valuable tool to teach airport familiarization skills to novice drivers. Most airports have on going airfield construction projects. These never ending construction projects bring with them a host of drivers who have minimal to no experience driving in the airport environment. The Mobile Trainer can also address this problem. It can not only simulate an actual ARFF response, but also can provide familiarization training for airfield maintenance workers, snow plow operators, security personnel, and airport managers which would be useful in their routine navigation on airport property.

Airport Familiarization: If a program does not begin with an airport orientation, it does not begin to instill in a driver respect for aviation operations that take place on the airside of the operations fencing. Airport vehicle operators need the interaction that takes place as they approach runway and taxiways. Signs, airfields markings and air traffic communications all are important to the safe operation of driving in the airport environment. An effective airport driver-training program educates personnel about aviation and airport operations and the safety procedures necessary to assure safe operations on the airfield.

Aircraft Operations: In the computer simulator, drivers are given the opportunity to see the same three-dimensional buildings, aircraft, baggage vehicles, fuel trucks, taxiway signs, and runway markings as they would see them on the actual airfield areas. When aircraft and ground vehicles operate in the same areas, there is a need for specific rules to insure operational safety. Drivers must know these rules and be given the opportunity to practice their driving skills. The mobile simulator provides a safe environment to sharpen and test these skills.

Air Traffic Control (ATC) function on the Airport: ATC, is an integral part of many airport environments, and plays a critical role in exercising responsibilities that affect life and property at the airport. Communication between ATC and all vehicle operators as they relate to one another on the airfield surface is an absolute necessity. Drivers must be given opportunities to practice the necessary skills of ATC communications while driving in the complex airport safety operations area.

Equipment Limitations: The safe operation of vehicles on airports requires knowledge of the operating requirements and limitations of the various pieces of equipment. Center of Gravity (CG) location, CG shifts, and turning radius are as important to baggage carts, fuel trucks and rescue vehicles as they are to aircraft. All drivers who have access to the airport safety area must

learn to drive efficiently and safely. A simple accident with a maintenance vehicle, tractor, fuel truck or airport management vehicle can needlessly tie up the airport runways or taxiways for hours while the accident site is cleaned up. All drivers need to know the limitations of their vehicles when out on the airfield.

Testing: The proof of any program is how it provides for the evaluation of its own effectiveness. Those using the driver simulator are provided with instructor feedback and a significant skills level evaluation and critique.

Conclusion: The FAA is working closely with manufacturers to increase the dynamic performance of airport heavy rescue vehicles. This alone will not resolve the rollover crisis. All personnel who are expected to exercise driving privileges on our busy airports need the opportunity to sharpen their driving skills without risk to the airport or vehicles they are expected to drive. Recent ARFF vehicle rollovers resulted in an average of $200,000 damage per accident. For that same cost of $200,000, approximately 200 firefighters from different airports could receive valuable virtual reality driver simulation training, thus having an opportunity to buildup their driver skill levels. Where do you want to spend your money – on driver training or for repairs or replacement of your airport vehicles? ARFF emergency drivers, airport familiarization training for new airfield drivers, snowplows operators, security, airport management and maintenance field worker can all benefit from the computer controlled virtual reality trainees that are now available.